

GAME FISH FARMING IN ALBERTA

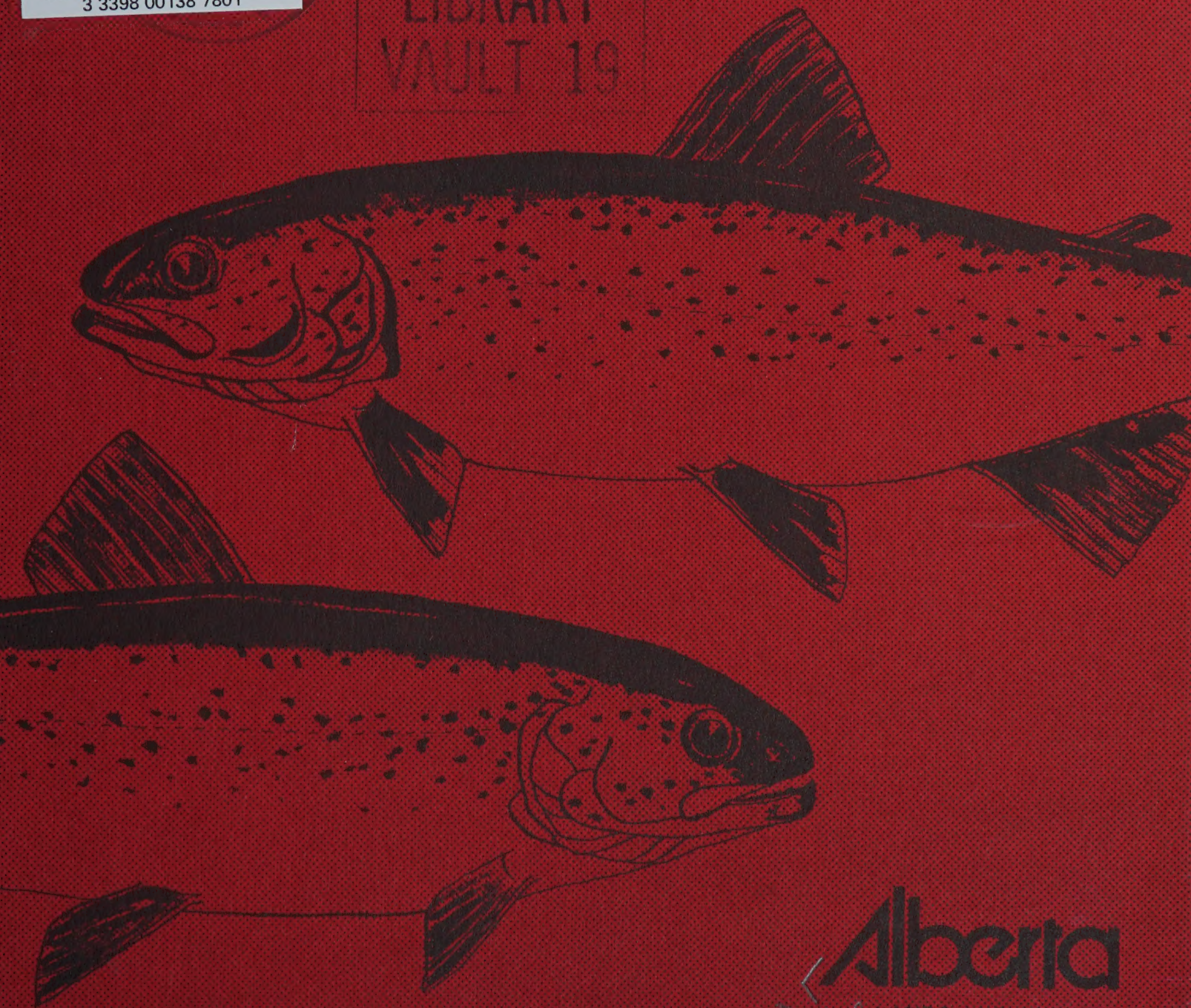
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Game Fish Farming in Alberta.



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GAME FISH FARMING

IN

ALBERTA

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A PUBLICATION

OF

FISH AND WILDLIFE DIVISION

ALBERTA DEPARTMENT OF LANDS AND FORESTS

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A summary of current legislation and some background information on fish farming.

The book is designed to provide the reader with a reference work which will enable him to obtain the information he needs for the successful operation of a game fish farm. It is intended to provide the reader with a guide to the various aspects of the industry, from the selection of a site to the marketing of the product. The book is intended to be a practical guide to the industry, and is not intended to be a theoretical work. The information is presented in a clear and concise manner, and is intended to be a practical guide to the industry.

Part I. Game Fish Farming for the Beginner

Types of Farming

The book "Game Fish Farming" covers a variety of different types of operations, for pleasure, for commercial gain and for educational purposes. These are described in more detail under each of the different headings.

Expanding Farming

The Fish and Wildlife Division is not currently able to accept an additional license. During its recent operations in the field the Division's staff will need to be in a position to provide the necessary

GAME FISH FARMING IN ALBERTA

JUNE 1970

Introduction

A program of licencing private and commercial game fish farms has been in existence in Alberta for some years. With increasing interest in this topic and the passage of new 'Game Fish Farm Regulations' in 1970 it has become necessary to update our previous brochures so as to provide a summary of current legislation and some background information on fish farming.

It must be emphasized that fish farming is a relatively new concept in western Canada and that there is very little specific information or advice that can be offered. Recent studies carried out by the Fisheries Research Board in Manitoba suggest that there may be a good potential for fish farming in some parts of the prairies. The Alberta Fish and Wildlife Division is carrying out some studies of its own to determine the potential in different areas of the province. The information on fish culture in this brochure is only intended to provide broad guidelines so that the potential fish farmer may have an idea of the possible problems facing him.

Part A Alberta Requirements for Fish Farming

Types of Operation

The term 'game fish farm' covers a variety of different types of operation; for pleasure, for commercial gain and for promotional purposes. These are described in more detail under sections on the different licences.

Extension Service

The Fish and Wildlife Division is not currently able to supply an extension service. Owing to other commitments in the field the Division's field staff will rarely be in a position to provide specialized

advice. This brochure is intended to provide some substitute, although it is realized that this may not be adequate for all purposes. Additional reference material is listed in an appendix to this brochure.

Types of Licence

A. Private Game Fish Farm Licence

A Private Game Fish Farm Licence permits the holder to acquire, grow, breed and keep those game fish and game fish eggs specified on his licence for his own personal use and the use of his friends. The holder of this licence may not traffic in or sell his fish. It is intended for those people who have a dugout or small lake on their property and who wish to stock it for their own private use, to harvest the fish by angling or with nets, providing both recreation and fish for the freezer.

B. Commercial Game Fish Farm Licence

A Commercial Game Fish Farm Licence permits the holder to acquire, traffic in, grow, breed, keep or sell those game fish and game fish eggs specified on his licence.

The following types of operation are possible under this licence:

- (a) The holder may stock and harvest fish for commercial market sale. Under the provisions of the Fish Marketing Act these fish must be sold either directly to the consumer (not through a retail outlet) or to the Freshwater Fish Marketing Corporation. The Corporation has a number of agents in Alberta and arrangements can be made with them for receipt of the fish.

Since many species of game fish are highly perishable, great care must be taken to ensure that the fish are properly iced and reach the agent in top quality condition. Officers of the Fish and Wildlife Division can advise the fish farmer

on the requirements of the Fish Marketing Act and steps necessary for the maintenance of fish quality.

- (b) The holder may stock fish for recreational harvest, charging for the fish caught by angling. People angling at such an establishment do not require a provincial angling licence but should be in possession of a receipt showing the source of the fish, for their own protection.
- (c) The holder may operate a commercial hatchery, breeding and raising his own stock for sale to private game fish farmers, the Freshwater Fish Marketing Corporation, or to consumers.
- (d) The holder may act as a broker, importing fish from suppliers outside the province and reselling in smaller lots to game fish farmers in Alberta. He may or may not require holding facilities for such an operation.
- (e) The holder may take the form of a private club or corporation, purchasing fish for the use of its paying members or shareholders.

C. Restricted Game Fish Farm Licence

A Restricted Game Fish Farm Licence entitles the holder to keep or sell live game fish in the places and within the times specified on the licence. It is intended to serve the needs of those putting on displays and promotions, and is issued only for a limited time period.

Residence Qualifications

There are no residence qualifications affecting an applicant for a Restricted Game Fish Farm Licence.

Private and Commercial Game Fish Farm Licences are only available to Alberta residents. For the purposes of these regulations a resident is defined as:

- (a) a person who makes his home and is ordinarily present in

Alberta and who has resided in Alberta for a period of 12 months immediately prior to his application or

- (b) a person or corporation incorporated in Alberta that has been carrying on business in Alberta for a period of 12 months immediately prior to the date of his application.

Types of Water Permitted

Waters qualifying for game fish farms generally fall into two categories:

- (a) Dugouts, stock ponds and small reservoirs. As a general policy, these will only be approved when the source of water is from surface runoff, wells, municipal or irrigation supplies. Sites supplied by springs or located on permanently-flowing streams will not normally be approved.
- (b) Lakes or sloughs completely surrounded by privately-owned land. A licence will not be issued for any lake to which there is public access, either by road allowance (developed or undeveloped), or by other publicly-owned land. A licence will not normally be issued for any lake from which excess water flows into any other natural lake or stream. If a lake is bordered by land owned by more than one person, then a legally-acceptable agreement must be submitted with the licence application indicating that all fish farming rights may be held by the applicant and that this is agreeable to each of the signees.

Water Bodies Covered by a Licence

A licence may be issued, granting rights on more than one water body. Each water body will be separately described on the licence. Such a licence will only be issued for land areas which are contiguous and which do not exceed a maximum of 640 acres. Separate licences are required for water bodies not falling within these terms.

Types of Fish Permitted

The following species of fish are permitted for use in game fish farms:

Rainbow Trout (*Salmo gairdneri* Richardson)
Cutthroat Trout (*Salmo clarki* Richardson)
Brown Trout (*Salmo trutta* Linnaeus)
Brook (speckled) Trout (*Salvelinus fontinalis*
(Mitchill))
Kokanee Salmon (*Oncorhynchus nerka* (Walbaum))

All game fish harvested for market must be sold either direct to the consumer or to the Freshwater Marketing Corporation.

The Fish and Wildlife Division reserves the right to restrict the species of fish permitted at any given location.

In general, results to date indicate that the rainbow trout is the species best suited to commercial production since it achieves the highest growth rates in one season and is readily available from commercial sources.

How to Obtain a Game Fish Farm Licence

1. The applicant should read this brochure carefully and determine whether his site is eligible for a licence. Wherever necessary he should obtain a water permit from the Water Resources Division, Alberta Department of Agriculture.
2. Game Fish Farm Application Forms may be obtained from any Fish and Wildlife Division Office. It is essential that this form be completed in full. Partially completed forms will not be accepted. This information is necessary to determine whether the site may be eligible for a licence. The completed form should be submitted to your nearest Fish and Wildlife Office. (Locations and mailing addresses may be found on pages 33 and 34.

3. All sites are subject to inspection, but inspection may not be carried out prior to issuance of the licence. For this reason a fully completed and accurate application form is essential. In the event that a licence is issued without prior inspection it must be understood that if, on subsequent inspection, the site is found not to be acceptable the licence may be cancelled and disposal of the fish stocks charged against the licensee.
4. Licences will be issued as soon as possible following receipt of application, but applicants should allow adequate time for review and title search where applicable.

Licence Fees

Fees charged are as under:

Private Game Fish Farm Licence:

Initial fee	\$ 10.00
Renewal fee (annual)	\$ 5.00

Commercial Game Fish Farm Licence:

Initial fee	\$ 50.00
Renewal fee (annual)	\$ 15.00

Restricted Game Fish Farm Licence: \$ 5.00

With the exception of the Restricted Licence, all licences are issued for the period April 1st until March 31st in the year following.

Before submitting licence fees it is advisable to check with your local Fish and Wildlife Officer, since fees are subject to change.

How to Obtain Fish

Game fish or game fish eggs may be obtained from holders of Commercial Game Fish Farm Licences in Alberta. Alternatively, they may be imported from suppliers in other provinces or in the United States. Lists of these suppliers may be obtained from the Fish and Wildlife Division Office in Edmonton. The provincial government is not in a position to supply fish for fish farming from its own hatcheries.

Arrangement for the supply and purchase of fish must be made by the individual fish farmer.

Cost of Fish

Prices of fish vary considerably according to the supplier and the size of fish to be purchased. Fish in the 1-3 inch range cost in the neighborhood of \$50 to \$80 per thousand. Prices are commensurately higher for larger fish. Transportation costs are extra.

Returns from Fish Marketed

It is not yet definitely known what price the Freshwater Fish Marketing Corporation will be able to offer to the producer. Marketing trials are under way to establish reasonable estimates. It seems possible at the present time that a high quality product could return in the order of 50-60 cents per pound.

Inspection of Fish for Diseases

Anyone wishing to import live game fish or game fish eggs into Alberta must first obtain a permit from the Director of Fish and Wildlife. In addition, a live fish imported into Canada are subject to federal inspection requirements. Notice of intention to import must be submitted to the Department of Fisheries, Ottawa at least two weeks prior to shipment, and the shipment must be accompanied by a certificate signed by an approved fish pathologist, certifying the shipment to be free of the disease Viral Haemorrhagic Septicemia (VHS) and Whirling Disease (Myxosoma cerebralis).

The Alberta Fish and Wildlife Division may wish to inspect any shipment of fish entering the province to determine its freedom from disease.

If at any time a licensee knows or suspects that he has diseased fish on his game fish farm he must immediately submit a report of this disease to the Director of Fish and Wildlife. A licensee is required to provide any prophylactic treatment, or any other treatment, both for diseased fish and as a preventive measure for healthy fish, that the Director

may require. The Director may require the destruction and disposal of any fish which are diseased or which he has reasonable grounds to believe may be diseased. If a game fish farmer fails to comply with an order to destroy his fish within the time allotted, an employee of the Fish and Wildlife Division may be authorized to destroy them and the cost of such work will be chargeable against the fish farmer.

Other Requirements of the Fish Farmer

(a) Private Game Fish Farmer:

The holder of a Private Game Fish Farm Licence should ensure that he obtains a receipt for all fish purchased for use on his fish farm. He should keep this receipt in a safe place as it is his only proof of the source of these fish.

(b) Commercial Game Fish Farmer:

The holder of a Commercial Game Fish Farm Licence should ensure that he issues a receipt for all fish purchased from his fish farm. This receipt should contain the following information:

- (a) name and address of licensee
- (b) licence number
- (c) name and address of purchaser
- (d) date of transaction
- (e) number of each species sold or disposed of.

In addition, a Commercial Game Fish Farmer is required to submit to the Director of Fish and Wildlife a semi-annual report on the first of January and the first of July, containing a record of all transactions completed during that period.

Other Pertinent Information

1. Game fish farm licences are not transferable.
2. A game fish farm licence confers no right of ownership upon the waters for which the licence is issued, only the right to

- raise fish in these waters for the time period specified.
3. A fish farmer may not use explosives for the taking, killing or harvesting of any game fish. Chemicals may only be used with the express authorization of the Director of Fish and Wildlife.
 4. A fish farmer may not take or attempt to take live fish or live fish eggs from public waters for the purpose of stocking a game fish farm.

Protection of Public Fisheries

For the protection of public fisheries from possible fish disease it is prohibited to release any live or dead fish from a game fish farm into any public fishing waters or any other waters not authorized on the licence. To prevent potential loss of fish during spring runoff or other overflow conditions a fish farmer may be required to install a gravel filter on any overflow from his fish farm.

Government Stocking Program

Some private landowners may not wish to purchase fish for fish farming but may be prepared to provide public fishing on their land. The Fish and Wildlife Division is prepared to stock waters on private land if public access is guaranteed and if such a water body would contribute significantly to the provision of recreational fishing in the area. Anyone willing to provide public access in this way should inform the Fish and Wildlife Division and an inspection of the site may be arranged.

Where public access is provided, some additional facilities such as refuse containers, picnic tables and sanitary facilities may be necessary. Some municipalities and service clubs (e.g. Fish and Game Associations) may be prepared to assist in the development and/or maintenance of facilities. Any organization sponsoring a fish pond on private property should obtain a lease or legal agreement to ensure continued public access before expending effort and funds. Such a lease

should protect both the interests of the organization and the rights of the landowner. Before an organization proceeds beyond the planning stage they would be advised to contact the Fish and Wildlife Division to determine the suitability of the project.

Part B Management of Trout Ponds

Following application for a Game Fish Farm Licence an inspection of the proposed site may be carried out by a representative of the Fish and Wildlife Division. Approval of the site for fish farming only signifies that it meets the requirements of the Game Fish Farm Regulations. It does not in any way indicate suitability for fish farming or guarantee the survival of fish. The following section is included to provide the prospective fish farmer with some background information so that he may reduce his mistakes and problems to a minimum.

Introduction

To survive, grow and reproduce trout require clean, cool water with high dissolved oxygen concentrations, food and clean gravel (silt-free) on which to spawn successfully. Trout also require cover, such as deep water, undercut banks and log jams which serve as hiding or resting areas. Fortunately, trout are adaptable to a much wider range of conditions. Few farm ponds will have suitable habitat for trout reproduction but many will support trout on a 'put-and-take' basis. Survival is often limited by low dissolved oxygen concentrations and high water temperatures or a combination of these. Growth is determined by the productivity and the management of the pond. Productivity is influenced by the fertility of soil under the pond and the watershed, climatic factors (temperatures, wind, and precipitation), and the quality and quantity of water flow through the pond. Many factors that influence the productivity of agricultural crops also influence food production in farm ponds. Trout will achieve maximum yields when supplied with an abundance of food, but temperature and oxygen

concentrations must remain within tolerable limits. Frequently ponds with high productivity will have a low supply of oxygen during winter. Management techniques may be utilized to grow many fish slowly or fewer fish at higher rates. Without management the total productivity of the pond may be wasted or used by less desirable fish.

Criteria for Trout Survival

Temperature

Water temperatures in a pond are influenced by climatic conditions and the temperature and volume of inflowing water. A trout farmer cannot change the climate but he can manipulate other features of the pond to ensure tolerable water temperatures. At optimum temperatures (55° - 65° F) trout achieve maximum growth rates and remain active for the angler. Trout will usually survive if surface temperatures remain below 75° F over the deeper areas of a pond. Trout may even survive a gradual temperature change up to 80° F if other conditions (oxygen levels) are ideal, but high temperature or rapid fluctuations often result in trout mortality. As water becomes warmer trout are less tolerant to changes in temperature. Maximum temperatures are lower in ponds having good depth (10-12 feet) and a minimum area of shallow water, or in a pond which is supplemented with well water. Ponds with summer water temperatures below 50° F, such as those completely supplied from wells, have low food production and trout growth rates are slow. Low temperatures may be overcome by retaining the water in the pond for longer periods.

A prospective trout farmer should at least measure surface temperatures during the summer prior to stocking. Better criteria are sub-surface temperatures at various depths. A variety of elaborate (and costly) equipment is available for measuring temperature but adequate results can be obtained using a simple and inexpensive method. Attach capped bottles, filled with pond water, at 5-foot intervals on a light chain, and suspend this from a log or board anchored near the center of the pond. Daily or weekly water temperatures, measured in each jar with an ordinary pocket thermometer, will provide a guide to average and limiting conditions at each depth. Similar temperatures at surface and bottom

usually indicate circulation of water in the pond. In deep ponds (over 20 feet) a rapid change in temperature (3° F in a 5-foot interval of depth) indicates that the areas below this depth are not being circulated and oxygen concentrations may be insufficient to support trout. If the temperature remains below 72° F at 3 feet below the surface, trout have a good chance of summer survival. This limit may be stretched a few degrees higher if the increase in temperature is gradual (less than 10° F in a week).

Oxygen Requirements

High dissolved oxygen concentrations are essential for trout survival. Dissolved oxygen concentrations vary with the abundance of organic matter (plants and animals), water temperatures and circulation. Low dissolved oxygen concentrations frequently limit the over-winter survival of trout and may be a limiting factor for summer survival. Under natural conditions trout can survive oxygen levels of 2 ml/l (millilitres per litre) for a short period, but generally dissolved oxygen concentrations should exceed 5 ml/l.

Living plants produce oxygen during periods of sunlight but at night or on cloudy days plants use oxygen in the water. Decaying plants and animals (and animal wastes) use oxygen and produce gases (hydrogen sulphides and ammonia) which are poisonous to fish. Hydrogen sulphide also removes oxygen from the water. With recommended stocking rates the amount of oxygen consumed by fish is insignificant compared with that used by decaying vegetation. Water temperatures affect the solubility of oxygen in water. Oxygen is readily dissolved in cold water. As water becomes warmer oxygen may be released into the atmosphere. Circulation of water in the pond, either by wind action or the flow of water through the pond, moves water from the bottom to the surface, where undesirable gases are released and oxygen is absorbed. In the summer, water at the bottom of the pond is frequently cooler and should contain more oxygen but oxygen rapidly disappears when close to decaying organic matter.

Without circulation the cool water near the bottom becomes low in dissolved oxygen and surface waters become very warm. Trout are trapped between water that is too warm and water that has insufficient oxygen. When these conditions become extreme the trout will die. During the fall, circulation is essential if trout are to survive over winter. As the water cools, enough oxygen must be dissolved to supply all the needs of decaying organic matter and maintain adequate concentrations for trout until spring.

The time to prevent low oxygen concentrations in a pond is during planning and construction. Removing organic soils from the bottom, ensuring adequate depths and wind exposure, will encourage higher oxygen concentrations. Other methods, such as spraying water onto the surface of the pond, circulating with water pumps or compressed air and removing snow from the ice (ploughing or spreading coal dust) must be done annually and could be expensive. These methods have not been thoroughly tested in Alberta and are not recommended except on an experimental basis. In many cases rebuilding the pond (i.e. removing organic muds, deepening) is simpler and less expensive if calculated over a period of years.

Measuring dissolved oxygen concentrations in the past was a relatively simple procedure but the equipment required was expensive and chemicals were unstable and hard to find. Scientific supply companies now sell inexpensive (less than \$25.00) kits with chemicals that are easy to store and convenient to use. The water sampler that collects water from various depths remains an expensive piece of equipment (\$60.00 - \$80.00) but even surface oxygen concentrations give some indication of conditions in the pond.

The fish farmer can avoid the need for sophisticated equipment by good pond construction, checking summer water temperatures and by careful management with the first planting of fish.

Kinds of Trout for Farm Ponds

Generally only rainbow trout (Salmo gairdneri) and brook trout (Salvelinus fontinalis) are available from commercial fish hatcheries.

In most farm ponds other species are not recommended. Rainbows adapt to a variety of conditions and are fast growing. This characteristic makes them most desirable in ponds managed on an annual "put and take" program. Brook trout are also adaptable and withstand slightly lower oxygen concentrations but growth rates are slower. Brown trout (Salmo trutta) show satisfactory survival under a variety of conditions but are not recommended because they are difficult to catch. Planting a mixture of species has no particular advantage other than variety. A variation in growth rates makes management more difficult (i.e. gill netting or stocking).

Stocking Program and Rates

The type of stocking program employed and the size of fish purchased depends much on the type of fish farming desired. If you are stocking for angling during the summer you will require yearling fish (5-6 inches). If there is some over-winter survival of fish you may use smaller fish, but these will not be available for harvest until the following year. If you are stocking for commercial sale you will require a fish weighing 8-12 oz. by fall. How large a fish you need to stock to achieve this size will depend upon the productivity of the pond and the part of the province you live in.

It should be emphasized that an experimental approach to stocking rates is essential. The individual fish farmer must learn by experience and adjust the rates per acre and the size of fish purchased according to the results he requires and the success he achieves in the initial stages. The provincial government stocks, as a general policy, fingerlings (2-3 inches) at 5-700 per acre and yearlings (4-5 inches) at 2-300 per acre. The Fisheries Research Board has had success using a stocking rate of 200 per acre in rich lakes in Manitoba.

The Fish and Wildlife Division will attempt to assess the success of fish farmers in different areas of the province and make this information available to assist in improved management.

Fish should generally be stocked as soon after break-up as possible, as trout are most easily transported and adapt more readily when water temperatures are low.

Diseases

Control of fish disease is most important to the fish farmer. A game fish farmer has a legal obligation to report the presence of fish showing abnormal behavior or appearance to the Fish and Wildlife Division. This action may protect wild populations but is just as important to the individual fish farmer. Early action may prevent the loss of a complete stock of fish.

Abnormal appearance or behavior in fish may be the result of low oxygen, high temperatures, dietary deficiency, organic disease, or disease caused by viruses, bacteria, fungi or the larger animal parasites. Some diseases occur commonly in wild or hatchery fish stocks and are of little consequence to the trout farmer or the Fish and Wildlife Division. Other diseases can be of serious consequence and must be controlled.

Harvest

Fish not harvested by angling may be removed with the use of nets. Seine nets can be used in small ponds with a fairly smooth bottom. Otherwise gill nets are to be preferred and are more effective. The depth and length of net required will depend upon the size of the pond and the size of the fish to be harvested. Trout are generally best caught during the hours of darkness, by setting the net in the evening and lifting the following morning. They should not be allowed to remain in the net longer than absolutely necessary. They should be cleaned and packed in ice as soon as possible after removal from the net, as the quality will deteriorate rapidly.

Aquatic Vegetation

Aquatic vegetation influences the fishery by changing dissolved

oxygen concentrations and by providing food and cover. It may also affect the quality of angling and the efficiency of harvest with nets. Plants benefit or ruin a fishery depending on the types of plant and their relative abundance.

On bright sunny days growing plants produce oxygen. At night and on cloudy days plants deplete the oxygen. Plant decay uses oxygen and produces poisonous gases. An abundance of minute green plants produces large quantities of trout food, increases growth rates and the pounds of trout that the pond can produce. An over-abundance of plant plankton, such as algae, often forms thick mats on the surface which affects angling and during cloudy weather causes oxygen depletion, resulting in a fish kill. Rooted aquatic plants such as waterlilies and pond weeds provide cover for fish. Angling adjacent to such areas often produces good results. Large areas of rooted plants interfere with fishing and increase winterkill problems.

Control of undesirable aquatic vegetation is best achieved during pond construction. Plankton can be kept to a desirable level by having good wind exposure, a clean cool water supply, adequate depths and some water flow. Rooted aquatic plants are controlled by keeping shallow water areas to a minimum and correctly sloping the banks. A good crop of plankton limits light penetration and reduces the depths at which rooted aquatics become established. If large areas of shallow water cannot be avoided, black plastic sheeting laid on the bottom will restrict the growth of rooted aquatics.

In established ponds, mechanical methods such as handpulling, mowing, raking, or over-winter drainage should be considered. If these methods are not effective or practical the owner may have to resort to herbicides. Chemical control of plants is a continuing program and in some cases is only effective for part of a season. Before deciding on a control program, determine the type of plants causing the problem. Different types of aquatic plants are affected by different chemicals and require different methods of application. When fish are present in a pond the chemical must be harmless to fish and the quantity used

should be carefully calculated according to the volume of water in the pond. Treatment should be carried out before vegetation becomes abundant, because killing plants during mid-summer may cause a sudden drop in oxygen concentration and result in trout mortality. If rooted aquatic plants interfere with angling, strips or patches of plant cover may be treated to facilitate angling, while some cover is retained for the fish.

A permit must be obtained prior to the application of any chemical to surface waters, with the exception of private dugouts or small sloughs located on private land. A pamphlet "The Control of Aquatic Plants in Alberta", available from the Departments of Agriculture, Health, or Lands and Forests, describes the approved methods of vegetation control, types of aquatic plants and how to use chemicals that are safe and effective. Even when a permit is not required the owner of a trout pond should obtain a copy of the pamphlet and carefully follow the recommendations before attempting aquatic plant control.

Feeding

In a natural lake or slough the feeding of trout is rarely necessary. In small dugouts or ponds, feeding commercially-prepared pellet meal or ground meat could be used to increase growth rates. Fish fed in this way will soon become tame and easier to catch. However, excess feed accumulated in the pond may deplete the available oxygen supply.

Watershed Management

Good watershed management is important for the survival of fish and lengthens the useful life span of a pond. In the natural life history of any pond, inflowing waters bring nutrients into the pond and increase the productivity. Thus the pond fills with silt, accumulates organic matter and aquatic vegetation becomes abundant. Water temperatures get warmer and dissolved oxygen is quickly used up by decaying plants. Eventually the pond becomes worthless as a trout fishery. Good watershed management delays the aging process of a pond.

Intermittent watercourses should be left in natural vegetation, or grasses should be established. Similarly, main runoff areas should be well vegetated and utilization (grazing and cultivation) should be kept to a minimum. Efficient farming techniques keep topsoil on the land where it grows crops rather than in the farm pond, where it causes a premature death to the trout fishery.

Landscaping

The owner of a fish pond will undoubtedly wish to protect the land adjacent to the pond and increase the aesthetic value of the area. Such a program provides recreational benefits, protects the fishery and provides areas of wildlife habitat. All ponds should be fenced and protected from livestock. Watering areas should be restricted, well gravelled and have minimum slopes. Preferably, stock watering should be done by piping water into troughs below the reservoir. Under no circumstances should livestock be allowed near an earth-filled dam or spillway.

Trees may be planted around a pond but care should be taken to allow exposure to the prevailing winds. Trees should not be planted closer than 30-50 feet from the waters edge, so that there is ample space for recreation close to the pond (picnicing, fishing, etc.). Within this area a vigorous sod-forming grass should be planted.

Pollution

No fish farmer will purposely pollute his fishery operation and threaten the survival or marketability of his product. Pesticides or herbicides should not be applied close to the pond or along any water courses draining into the pond. Many pesticides are lethal to trout. Trout may accumulate pesticides in body tissues with the result that they are not safe for human consumption and will not be accepted for sale.

Drainage from barnyards or feed lots will add nutrients and

accelerate plant growth. These may cause algal blooms and increase chances of both summerkill and winterkill.

Building a New Pond

Engineering details for the construction of farm ponds are not included in this pamphlet because of the great variety of soils and climatic conditions in Alberta. Such information and, in some cases assistance, may be obtained from PFRA or the Water Resources Division of the Department of Agriculture. However, some general aspects of pond location and construction that affect fish survival and management must be considered.

Location

Frequently someone building a pond will have only one location for a site or he may be influenced by alternative uses such as stock watering or irrigation. If a fishery is desired, criteria such as source of water, soil type, size, depths and wind exposure must be considered. Minimum standards cannot be cited for each criterion because the shortcomings of one may offset the excellence of another. For example, some farm dugouts with less than a ten foot depth of water, a clean bottom and good wind exposure have over-wintered trout, whereas lakes with a depth of fifty-five feet, organic bottom material and poor wind exposure, suffer a winterkill each year. The recommended standards given should be considered as a guide rather than a maximum or minimum goal that must be achieved.

Source of Water

A quantity of water, sufficient to keep the pond full during all seasons of the year and allow for other proposed uses (e.g. irrigation) is essential. Large volumes of runoff water, which cause excessive overflow, may necessitate an elaborate, costly spillway and pose a constant danger of washing out the dam.

Wells provide a good source of water but are generally too cold to allow high fish productivity. They are often expensive to

drill or may not supply a sufficient quantity of water.

Runoff water from a small watershed, supplemented with well water during mid-summer and during the winter, makes an excellent water supply for a fish pond. Such a combination gives the fish farmer some control over temperatures and dissolved oxygen supplies in the pond.

Soil Type

Soil types affect the productivity of a fish pond or agricultural crops in a similar way. Seldom is low productivity a problem in farm ponds. Usually the reverse is true because fertile bottom muds provide nutrients for an abundant growth of aquatic vegetation, which might increase the chances of a fish kill. Ravines with deep muskeg or organic soils should not be considered for a reservoir site.

Ponds built on sand or gravel may present problems with holding water in the reservoir, but if they are dug below the ground water table they are frequently more suitable for over winter survival than ponds built on clay. Sometimes ponds built on porous soils may be sealed with clay or a heavy gauge black plastic liner. A liner has the added advantage of controlling rooted vegetation.

Depth

Building a deep pond is not a cure-all that ensures fish survival, but depth is important. Reservoirs should be located at a site that allows good depth in most areas of the pond without requiring a great amount of costly earth moving. One small area of deep water is not desirable because these small areas will probably stagnate (i.e. lose their oxygen). A good pond site has only a small percentage of the total area less than six feet deep and none under three feet. The rest of the bottom area should slope gently to a depth of at least 12 feet for summer survival and 18 feet for over-winter survival. With a dugout pond the depth can be controlled during construction.

Size

The size of the farm pond will probably depend upon the location available. A small pond with good overall depth is more desirable than a large shallow pond. Almost any size pond from one quarter to five acres makes a suitable fishery. Small ponds are easier and less expensive to build and manage. Large ponds require more fish to provide good angling and misjudgement about over-winter survival could be costly.

Ponds designed for public fishing should be five to ten acres in surface area. Ponds over twenty acres that will not support fish over winter are best utilized for commercial trout production.

Wind Exposure

Good wind exposure is important for a successful fishery. Wind circulates the water in the pond, moving stagnant water from the bottom of the pond to the surface, where poisonous gases are released into the atmosphere and a high concentration of oxygen is moved to all depths. The movement of water also prevents mats of algae from forming on the surface. Even in winter good wind exposure will assist the survival of trout by blowing snow off the ice and allowing some light penetration, which allows plants and algae to live and produce oxygen.

Pond sites in very deep ravines or surrounded by hills should be avoided whenever possible.

Pond Construction

Preparing the Site

When preparing the pond site before flooding, just removing the trees is not adequate. The whole area to be flooded must be scraped clean of trees, shrubs, organic matter and top soil. Top soil should be saved for landscaping the shoreline. If removal of deep organic soil (muskeg) is impractical, the site should be abandoned, because low oxygen concentrations will be a constant threat to trout survival.

Extra fill removed from the site may be used in dam construction, or to fill shallow areas of the pond. Otherwise earth should be levelled, covered with top soil and seeded to grass. Steep banks should be graded to a 1:1 slope. Steep banks dropping rapidly into deep water should be avoided, because erosion and slumping will fill the pond. More important is the hazard to people, especially children, who may fall into the water and drown because they are unable to get footing on the bottom or climb the bank.

Drains and Spillways

A properly designed drain and spillway are good insurance against washed out dams and improve the management potential of a pond. The emergency spillway should be built around, rather than over, the dam. A wide spillway which has water depths of only a few inches even during heavy runoff is desirable because trout have less tendency to enter shallow water. The emergency spillway should never be screened because during high water debris may plug the screen and cause the dam to wash out. The spillway should be protected from erosion by grass or if the gradient is steep it should be lined with rock.

A trout pond which has been formed by construction of a dam should have a bottom drain that allows complete draining. The benefits include harvesting trout, controlling coarse fish and aquatic vegetation, repairs to the dam, and the removal of silt and accumulated organic matter from the bottom. If the pond has a small frequent overflow a trickle tube should be installed. This will eliminate the loss of fish and keep the emergency spillway from being weakened due to continuous soakings. The same pipe can be used to supply water to livestock watering troughs below the dam.

Gravel Filters

Overflow water from any trout pond that enters natural waters must seep through a gravel filter to prevent the passage of fish. Gravel filters are constructed below the dam and emergency spillway so there is

no danger of damaging the reservoir. A filter must be large enough to handle all overflow water. Gravel used in the filter should not exceed three inches in diameter. The effective life of the filter will vary with the silt load and volume of flow through the reservoir. As the gravel becomes plugged with silt, vegetation etc. it must be made larger or rebuilt with fresh gravel. Water must not flow over or around the gravel filter.

Commercial Trout Production in Lakes and Sloughs

Some emphasis has been given in the foregoing sections to the management of constructed trout ponds, since more information on this aspect of trout production has already been accumulated in Alberta. As previously stated, the commercial production of trout in small lakes and sloughs is a new concept in this area and to date little useful advice can be offered.

Successful trout production will depend upon a single-season crop. If the lake is not subject to complete winterkill the fish farmer will undoubtedly suffer problems in the following year as a result of competition and predation from the larger, older fish. The production of marketable fish will be reduced, while these larger fish may not be acceptable on the market as a result of their size. They may also suffer from less desirable flavor.

Fish farmers considering commercial production are encouraged to read the publication 'Rainbow Trout Farming in Central Canada' (see appendix) and any other publications on this topic which the Fisheries Research Board of Canada may subsequently produce.

APPENDIX I

Further Reading (prices subject to change)

1. Trout Farming
By David B. Greenberg (\$12.50). Through U. S. Trout Farmers at \$8.50. Published by Chilton Company, Philadelphia, Pennsylvania 19100
2. Culture and Diseases of Game Fishes
By H. S. Davis (\$6.50). Published by University of California Press, P. O. Box 1588, Richmond, California 94800
3. How to Raise Trout for Fun and Profit
By Paul B. McAdam. Published by Jumping Rainbow Ranch, Box 848, Livingston, Montana 59047 (\$5.95)
4. Rainbow Trout Farming in Central Canada
By L. Johnson, G. H. Lawler and L. A. Sunde, Technical Report #165 Fisheries Research Board of Canada, Freshwater Institute, 501 University Crescent, Winnipeg, Manitoba (Free)
5. Trout Farming
By Paul Scheffer and L. Dean Marriage, Soil Conservation Service Leaflet #552, U. S. Department of Agriculture, Washington, D. C. (Free)
6. Trout and Salmon Culture
By Earl Leitritz. Published by State of California Fish and Game, Fish Bulletin #107, Sacramento, California 95800 (\$3.00)
7. Trout in Farm and Ranch Ponds
By Paul Scheffer. Farmers Bulletin #2154, U. S. Department of Agriculture, Washington, D. C. (Free)
8. How to Build a Farm Pond
By Walter Atkinson, Leaflet #259, U. S. Department of Agriculture, Washington, D. C. (Free)

9. Have Fun with Your Own Trout Pond
Published by U. S. Trout Farmers Association, 67 West 9000,
South Sandy, Utah (50¢)
10. Trade Magazine The American Fish Farmer
\$6.00 per year. From P. O. Box 1900, Little Rock, Arkansas
72203
11. Trade Magazine American Fishes and U. S. Trout News
Editor Clay Robinson (\$6.00 per year). Published by U. S. Trout
Farmers Association, 67 West 9000, South Sandy, Utah 84070

Some Useful Addresses:

Director, Central Region
Department of the Environment
Fisheries and Marine Services
501 University Crescent
Winnipeg, Manitoba

Freshwater Fish Marketing Corporation
1199 Plessis Road
Winnipeg, Manitoba
R2C 3L4

Freshwater Fish Marketing Corporation
11635 - 145 Street
Edmonton, Alberta
T5M 1V9

Regional Fishery Biologists

D. S. Radford
Regional Fishery Biologist
104 Administration Building
3rd Avenue & 9th Street North
Lethbridge, Alberta
T1H 0H5

G. E. Thompson
Regional Fishery Biologist
806 J. J. Bowlen Building
620 - 7th Avenue S. W.
Calgary, Alberta
T2P 0Y8

M. E. Kraft
Regional Fishery Biologist
304 Professional Building
4808 - 50th Street
Red Deer, Alberta
T4N 1X5

K. A. Zelt
Regional Fishery Biologist
7th Floor, O.S. Longman Building
6909 - 116 Street
Edmonton, Alberta
T6H 4P2

C. W. Hunt
Regional Fishery Biologist
Box 1390
Edson, Alberta
T0E 0P0

D. G. Buchwald
Regional Fishery Biologist
Box 1450
St. Paul, Alberta
T0A 3A0

F. Bishop
Regional Fishery Biologist
Box 1348
Peace River, Alberta
T0H 2X0

APPENDIX III

APPLICATION FOR A GAME FISH FARM LICENCE

LANDS AND FORESTS

Fill out and return to:

YOUR NEAREST

FISH AND WILDLIFE OFFICE

PLEASE PRINTName (in full) JOHN R. SALMONAddress R. R. # 4
(street Address or Rural Route)PONOKA Telephone No. (home) 723-8888
(city or town) (business) 724-9911How long have you resided at your present address? 5 yearsType of licence applied for (check one):
Private ☐
Commercial ☒
Restricted ☐

Are you a resident of Alberta as defined in the Game Fish Farm Regulations?

YESWhat is the exact legal description of land on which game fish farm(s) is located?
SE 1/4 Sec. 14 - Twp. 28 - Rge 7 - West of the 2nd Meridian

(must not exceed 640 contiguous acres)

Are you the owner or lessee of the above land? LesseeIf lessee, give name and address of owner Frank J. Brook
3911 - 112 Street, WetaskiwinNumber of water bodies Two

Page 2 of 3

Type of water body: Reservoir or dam ☐ Lake ☒
Dugout ☐ Slough ☐
Other (please specify)

If the water body(ies) above is a reservoir or dam, do you have a permit from
Water Resources Division, Department of Agriculture?Not Applicable.....

If so, give number

Source of Water: Surface runoff ☒ Well ☐
Municipal supply ☐ Stream ☐
Irrigation district ☐ Spring ☐
Other (specify)

Overflow water from the water body would flow intoDoes Not Overflow
(name of stream)

..... distance

Do you have any form of filter or screen on your overflow?No.....

If so, describe

Species of fish to be raisedRainbow Trout.....

I certify that all the above information is accurate and correct and that if
granted a Game Fish Farm Licence I will abide by all requirements of the Game
Fish Farm Regulations.

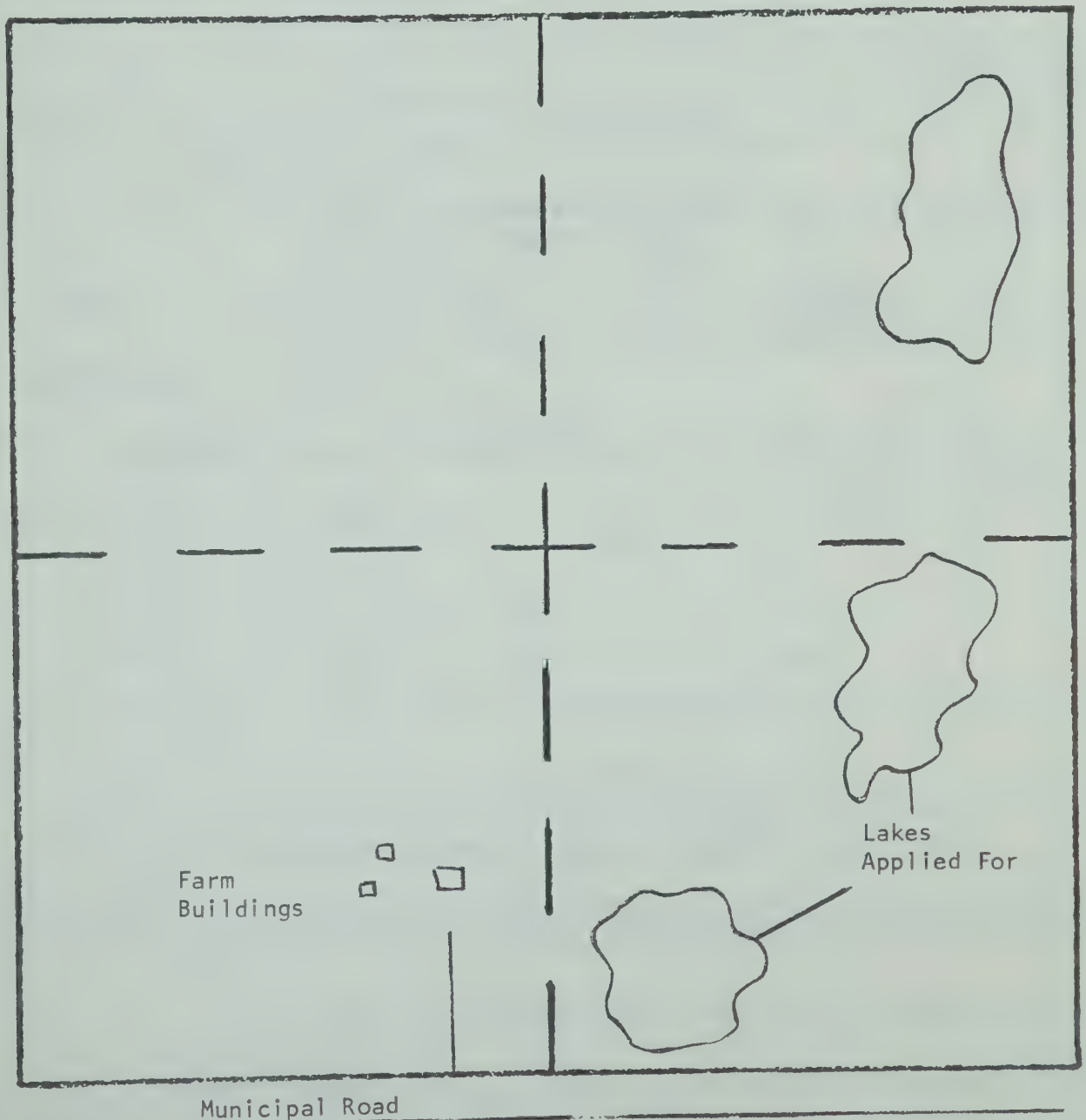
Signed

Date

NOTE: APPLICATIONS NOT COMPLETED IN FULL WILL NOT BE GIVEN CONSIDERATION

Page 3 of 3

Include a complete drawing of land area, showing all water bodies to be covered by licence, any other lakes, sloughs or streams and all public roads and road allowances. Give correct legal description of each quarter section.



Section .14... Township .28... Range .7....

West of the .2... Meridian



APPLICATION FOR A GAME FISH FARM LICENCE

LANDS AND FORESTS

Fill out and return to:

YOUR NEAREST

FISH AND WILDLIFE OFFICE

PLEASE PRINTName (in full) JAMES M. BROWNAddress 12111 - 47 Avenue
(street Address or Rural Route)MEDICINE HAT Telephone No. (home) 211-4481
(city or town) (business) 215-9222How long have you resided at your present address? 18 monthsType of licence applied for (check one):
Private ☒
Commercial ☐
Restricted ☐

Are you a resident of Alberta as defined in the Game Fish Farm Regulations?

YESWhat is the exact legal description of land on which game fish farm(s) is located?
NW 1/4 Sec. 7 - Twp. 14 - Rge 2 - West of the 3rd Meridian

(must not exceed 640 contiguous acres)

Are you the owner or lessee of the above land? OwnerIf lessee, give name and address of owner Not ApplicableNumber of water bodies One

Page 2 of 3

Type of water body: Reservoir or dam ☒ Lake ☐
Dugout ☐ Slough ☐
Other (please specify)

If the water body(ies) above is a reservoir or dam, do you have a permit from
Water Resources Division, Department of Agriculture?Yes.....

If so, give numberD 44883.....

Source of Water: Surface runoff ☒ Well ☐
Municipal supply ☐ Stream ☐
Irrigation district ☒ Spring ☐
Other (specify)

Overflow water from the water body would flow intoFish Creek.....
(name of stream)

Flows into South Saskatchewan River $\frac{1}{2}$ mile.....
..... distance

Do you have any form of filter or screen on your overflow?Yes.....

If so, describeGravel Filter 12' x 16' x 2' deep.....

Species of fish to be raisedRainbow Trout.....

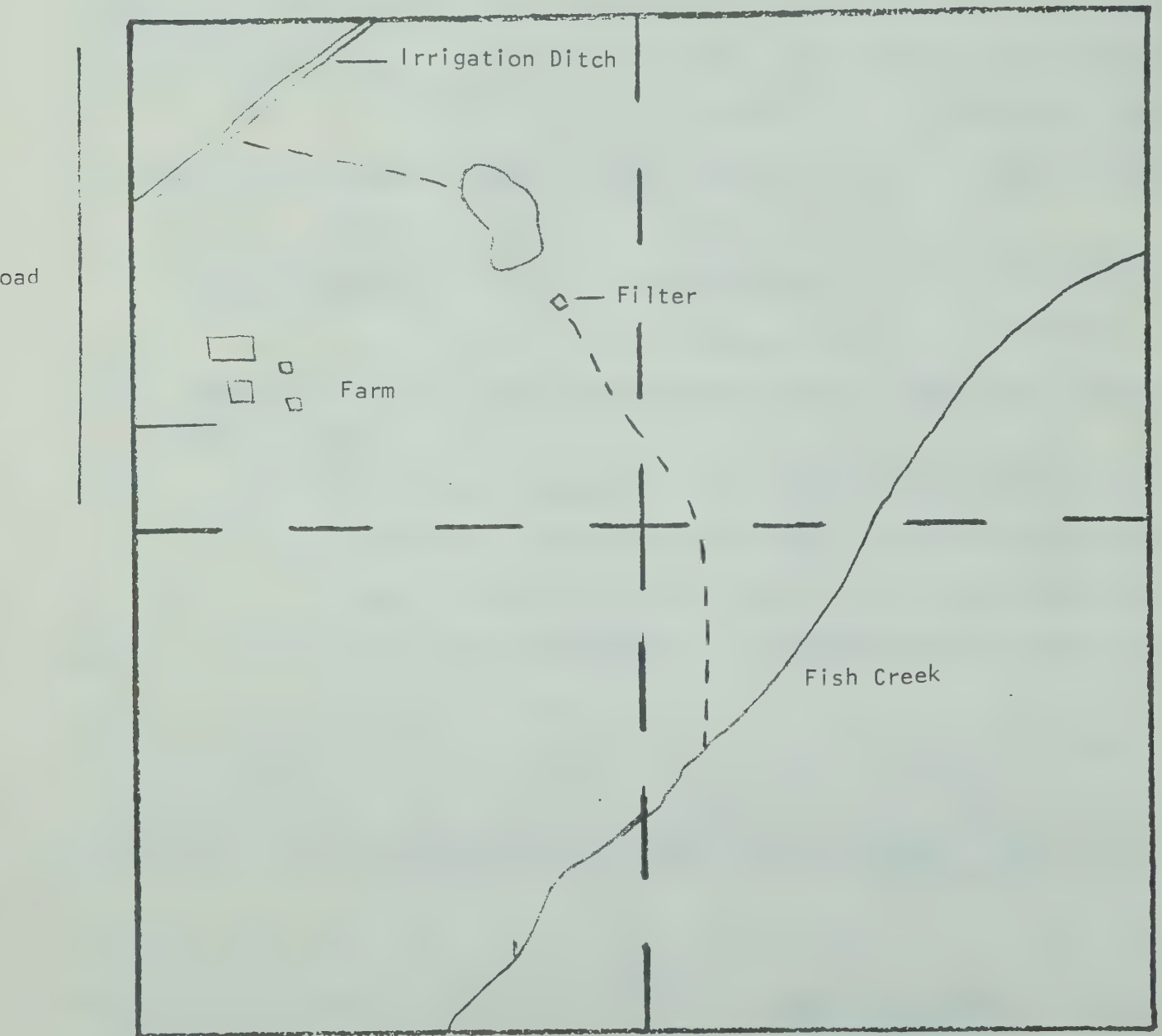
I certify that all the above information is accurate and correct and that if
granted a Game Fish Farm Licence I will abide by all requirements of the Game
Fish Farm Regulations.

Signed

Date

NOTE: APPLICATIONS NOT COMPLETED IN FULL WILL NOT BE GIVEN CONSIDERATION

Include a complete drawing of land area, showing all water bodies to be covered by licence, any other lakes, sloughs or streams and all public roads and road allowances. Give correct legal description of each quarter section.



Section ..7... Township ...14... Range ..2.....

West of the 3.... Meridian

MAILING ADDRESSES OF FISH AND WILDLIFE OFFICES

Fish and Wildlife Office
Box 572
Athabasca TOG 0B0

Fish and Wildlife Office
Box 917
Barrhead TOG 0E0

Fish and Wildlife Office
Box 416
Bonnyville TOA 0L0

Fish and Wildlife Office
Box 909
Brooks TOJ 0J0

Fish and Wildlife Office
806 J. J. Bowlen Building
620 - 7th Avenue S. W.
Calgary T2P 0Y8

Fish and Wildlife Office
211 Provincial Building
Camrose T4V 1P6

Fish and Wildlife Office
Box 388
Cardston TOK 0K0

Fish and Wildlife Office
Box 1148
Claresholm TOL 0T0

Fish and Wildlife Office
Box 297
Cochrane TOL 0W0

Fish and Wildlife Office
Box 144
Cold Lake TOA 0V0

Fish and Wildlife Office
Box 1918
Drumheller TOJ 0Y0

Fish and Wildlife Office
Natural Resources Building
Edmonton T5K 2E1

Fish and Wildlife Office
Box 1390
Edson TOE 0P0

Fish and Wildlife Office
Box 216
Evansburg TOE 0T0

Fish and Wildlife Office
Box 238
Foremost TOK 0X0

Fish and Wildlife Office
Box 330
Fort Chipewyan TOA 1G0

Fish and Wildlife Office
Box 245
Fort McMurray TOA 1K0

Fish and Wildlife Office
Box 570
Grande Cache TOE 0Y0

Fish and Wildlife Office
302 Provincial Building
9934 - 99th Avenue
Grande Prairie T8V 2L8

Fish and Wildlife Office
Box 28
High Level TOH 1Z0

Fish and Wildlife Office
Box 236
High Prairie TOG 1E0

Fish and Wildlife Office
Box 399
High River TOL 1B0

Fish and Wildlife Office
Box 303
Hinton TOE 1B0

Fish and Wildlife Office
Box 275
Lac La Biche TOA 2C0

MAILING ADDRESSES OF FISH AND WILDLIFE OFFICES CONT'D

Fish and Wildlife Office
104 Administration Building
3rd Avenue & 9th Street N.
Lethbridge T1H 0H5

Fish and Wildlife Office
Box 720
Manning TOH 2M0

Fish and Wildlife Office
308 Provincial Admin. Building
770 - 6th Street S. W.
Medicine Hat T1A 4J6

Fish and Wildlife Office
Nordegg
c/o Box 1598
Rocky Mountain House TOM 1T0

Fish and Wildlife Office
Box 1023
Olds TOM 1P0

Fish and Wildlife Office
Box 64
Oyen TOJ 2J0

Fish and Wildlife Office
Box 1348
Peace River TOH 2X0

Fish and Wildlife Office
Box 1420
Pincher Creek TOK 1W0

Fish and Wildlife Office
Box 547
Ponoka TOC 2H0

Fish and Wildlife Office
Box 549
Provost TOB 3S0

Fish and Wildlife Office
304 Professional Building
4808 - 50th Street
Red Deer T4N 1X5

Fish and Wildlife Office
Box 388
Rocky Mountain House TOM 1T0

Fish and Wildlife Office
Box 1450
St. Paul TOA 3A0

Fish and Wildlife Office
Box 447
Slave Lake TOG 2A0

Fish and Wildlife Office
Box 298
Stettler TOC 2L0

Fish and Wildlife Office
Box 727
Stony Plain TOE 2G0

Fish and Wildlife Office
Box 537
Strathmore TOJ 3H0

Fish and Wildlife Office
Box 485
Valleyview TOH 3N0

Fish and Wildlife Office
Box 597
Vegreville TOB 4L0

Fish and Wildlife Office
Box 1227
Vermilion TOB 4M0

Fish and Wildlife Office
Box 2048
Wetaskiwin T9A 1G2

Fish and Wildlife Office
Box 690
Whitecourt TOE 2L0

